Application No. 10/014,885
Paper Dated: March 21, 2005
In Reply to USPTO Correspondence of September 23, 2004
Attorney Docket No. 964-011861

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application No.	:	10/014,885	Confirmation No. 2379
Applicant	:	Franz Forster	
Filed	:	December 11, 2001	
Title	:	DRIVE DEVICE FOR A MACHINE WITH A TRACTION DRIVE SYSTEM AND A HYDRAULIC WORK SYSTEM	
Group Art Unit	:	3618	
Examiner	:	Bridget D. Avery	
Customer No.	:	28289	

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Sir:

This Appeal Brief is submitted in support of the Notice of Appeal mailed on December 16, 2004 and received by the Patent Office on December 20, 2004. The Notice of Appeal appeals the final rejection of claims 1-12 and 19-24.

The headings used hereinafter and the subject matter set forth under each heading are in accordance with 37 C.F.R. § 41.37.

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

03/21/2005 Patricia M. Lynch
Date Signature

Patricia M. Lynch
Typed Name of Person Signing Certificate

I

REAL PARTY IN INTEREST

Linde Aktiengesellschaft is the Assignee of the entire right, title, and interest to the above-identified application and, as such, is the real party in interest in this Appeal.

II

RELATED APPEALS AND INTERFERENCES

There are no appeals or interferences known to the Appellant, the Appellant's legal representative, or the Assignee of the above-identified application which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending Appeal.

III

STATUS OF CLAIMS

Claim 13 has been canceled.

Claims 14-18 are pending and have been allowed.

Claims 1-12 and 19-24 are pending and are appealed.

Claims 1, 4, and 19-24 stand finally rejected under 35 U.S.C. § 103 as being directed to subject matter that would have been obvious to one of ordinary skill in the art at the time the invention was made from the combined teachings of U.S. Patent No. 5,127,485 to Wakuta et al. (hereinafter "Wakuta") in view of U.S. Patent No. 5,469,928 to Adler et al. (hereinafter "Adler").

Claims 2 and 3 stand finally rejected under 35 U.S.C. § 103 as being directed to subject matter which would have been obvious to one of ordinary skill in the art at the time the invention was made from the combined teachings of Wakuta and Adler in view of the teachings of U.S. Patent No. 5,964,473 to Degonda et al. (hereinafter "Degonda").

Claims 5-12 stand rejected under 35 U.S.C. § 103 as being directed to subject matter which would have been obvious to one of ordinary skill in the art at the time the invention was made from the combined teachings of Wakuta, Adler, and Degonda in further view of U.S. Patent No. 5,289,905 to Braschler.

Claims 1-12 and 14-24 are reproduced in Appendix A, which is attached hereto.

IV

STATUS OF AMENDMENTS

A final Office Action (hereinafter "the Office Action") was mailed on September 23, 2004. There were no claim changes made after the final Office Action. The claims on appeal are the claims as amended by the Amendment dated June 25, 2004, which claims are finally rejected in the final Office Action of September 23, 2004.

V

SUMMARY OF THE INVENTION

As set forth in claim 1, the invention is directed to a fork lift truck drive comprising a traction drive system having a drive axle 1 with at least one drive wheel located on each end of the drive axle 1. The drive axle 1 has an axle housing 15 that is substantially

closed on all sides and is provided for connection with a vehicle frame 16. The drive also includes a hydraulic work system comprising a hoisting cylinder 2, 3 and/or a tilting cylinder and/or a hydraulic steering system. The hydraulic work system comprises at least one electric motor 13 and at least one pump 14 driven by the electric motor 13. The electric motor 13 and/or the pump 14 of the hydraulic work system is located inside the substantially closed axle housing 15.

As discussed in the pending application at pages 1-4, the invention provides significant advantages over known drive systems. For example, the principal components of the traction drive system and the hydraulic work system that were previously spacially separated from each other are combined in the invention into a single modular unit. Thus, space in the truck is saved by the relocation of the electric motor and/or the pump of the hydraulic work system into the drive axle of the traction drive system. In trucks that are driven by a rechargeable electric battery, the space thereby made available can be used to increase the size and volume of the battery. It is also possible that components of the drive device of the invention can be used both for the traction drive system and for the hydraulic work system. For example, the electric motor no longer requires its own housing if the housing of the drive axle is also used to house the electric motor. This arrangement drastically reduces the time and effort involved in manufacturing and assembly and leads to reduced manufacturing costs.

VI

ISSUES PRESENTED

The following issues are presented in this Appeal:

a) Are claims 1, 4, and 19-24 directed towards obvious subject matter in light of Wakuta taken in view of Adler?

b) Are claims 2 and 3 directed towards obvious subject matter in light of Wakuta and Adler taken in view of Degonda?

c) Are claims 5-12 directed towards obvious subject matter in light of Wakuta, Adler, and Degonda taken in further view of Braschler?

VII

GROUPING OF CLAIMS

Claims 1-12 and 19-24 do not stand or fall together but can be grouped according to the following:

a) Claims 1, 4, and 19-24 stand or fall together;

b) Claims 2 and 3 stand or fall together; and

c) Claims 5-12 stand or fall together.

The support for the independent consideration of each grouping of claims is addressed in the arguments set forth in the "Argument" section of this Appeal Brief and also for the fact that each grouping of claims stands rejected for a different grouping of applied references.

VIII

ARGUMENT

Each issue presented for review is addressed hereinafter under the appropriate heading:

1. 35 U.S.C. § 112, first paragraph

None.

2. 35 U.S.C. § 112, second paragraph

None.

3. 35 U.S.C. § 102

None.

4. 35 U.S.C. § 103

a) Claims 1, 4, and 19-24

Claims 1, 4, and 19-24 stand rejected for obviousness over the teachings of Wakuta in view of the teachings of Adler.

(i) Claim 1

Claim 1 is directed to a fork lift truck drive comprising a traction drive system having a drive axle with at least one drive wheel located on each end of the drive axle. The drive axle has an axle housing that is substantially closed on all sides and is provided for connection with a vehicle frame. The drive also includes a hydraulic work system comprising a hoisting cylinder and/or a tilting cylinder and/or a hydraulic steering system. The hydraulic work system comprises at least one electric motor and at least one pump driven by the electric motor. The electric motor and/or the pump of the hydraulic work system is located inside the substantially closed axle housing.

Wakuta, as best seen in Figs. 1, 3, and 13, is directed to a wheel motor 37 supported on a main frame 40 by a swivel shaft 38. As shown particularly in Fig. 1, the wheel motor 37 has a casing 1 with a traction motor 6 inside the casing 1. The traction motor 6 is connected to a wheel hub 10 by an output rotary shaft 9. Wakuta has a cooling system to cool the traction motor 6. The cooling system has an oil reservoir 2*b* located at the bottom of the casing 1 and an oil pump 27 that circulates oil from the oil reservoir 2*b* through passageways defined in the casing 1 to cool the coil 6*d* of the motor 6. The oil is then returned to the reservoir 2*b*.

Adler is directed to a passenger automobile 2 having a front wheel 4 driven by an electric motor 8 and a front wheel 6 driven by an electric motor 10. A steering linkage of conventional construction is coupled via a steering gear 12 and a steering column 22 with a steering wheel 20. A control unit 18 receives wheel speed signals from the motors 8 and 10 coupled to the front wheels 4 and 6. The control unit 18 also receives a position signal representing the steering angle of the steering wheel 20. Based on these signals, the control unit 18 generates a driving torque differential corresponding to a percentage wheel revolution differential between the wheels 4 and 6 and adjusts, e.g., increases, the output and torque of one of the motors to compensate for the difference in speed and/or torque of one of the wheels in a turn.

In paragraph 2 of the Office Action, the Examiner contends that Wakuta teaches the claimed invention with the exception of wheels mounted at each end of an axle and a hydraulic steering system. The Examiner relies upon Adler for these teachings. Appellant respectfully disagrees.

Firstly, Appellant respectfully disagrees with the Examiner that the Wakuta/Adler combination teaches wheels mounted at each end of a drive axle having an axle housing that is substantially closed on all sides, as claimed in claim 1. The Wakuta device has wheel motors 37 attached at the sides of the vehicle so that the wheel motors 37 are free to turn around a central axis of the swivel shaft 38 and are movable up and down (Wakuta at column 9, lines 33-36). In Adler, the wheels 4, 6 are driven by electric motors 8, 10 connected to a conventional steering gear 12. Adler does not teach wheels mounted at each end of "an axle". Rather, as shown in Fig. 2, the Adler vehicle 2 has the wheels 4 and 6 attached to independent electric motors 8 and 10. These wheels 4 and 6 are connected to a conventional steering linkage attached to the steering gear 12. Thus, Adler does not teach wheels mounted at each end of an axle but, rather, teaches wheels independently mounted to separate electric drive motors and connected to a conventional steering linkage. Additionally, Appellant disagrees that Adler teaches a hydraulic steering system. As set forth in Adler at column 1, lines 13-35, the Adler system of electrically driven wheel motors is designed to replace previously known hydraulic steering systems.

Moreover, Wakuta and/or Adler do not teach a hydraulic work system comprising a hoisting cylinder and/or a tilting cylinder and/or a hydraulic steering system, with the hydraulic work system having at least one electric motor and at least one pump driven by the motor, and with the motor and/or the pump of the hydraulic work system located inside the drive axle of the vehicle. The oil pump 27 of Wakuta is a small cooling pump that circulates oil from the oil reservoir 2*b* in the wheel motor to cool the coils of the traction motor 6. Adler teaches a conventional steering linkage. There is no teaching or suggestion in Wakuta and/or Adler to dispose the electric motor and/or the pump of a

hydraulic hoisting cylinder, tilting cylinder, or hydraulic steering system inside an axle housing, as claimed in claim 1. Both Wakuta and Adler have independent wheel motors independently attached to the driven wheels. At best, the Wakuta and Adler combination would simply result in the Adler device having the Wakuta cooling apparatus incorporated into the electric motors of the driven wheels.

(ii) Claims 4 and 19-24

Claims 4 and 19-24 depend either directly or indirectly from claim 1. Therefore, claims 4 and 19-24 are believed patentable over the Wakuta and Adler combination for the same reasons as discussed above with respect to claim 1. Additionally, the Wakuta and Adler combination does not teach or suggest the limitation of claim 19 that the electric motor of the hydraulic work system or the traction motor of the traction drive system is an oil-cooled electric motor connected with an oil circuit of the hoisting cylinder, tilting cylinder, or hydraulic steering system. In the Wakuta device, the small hydraulic pump 27 simply circulates oil within the confines of the casing 1 to cool the coil of the electric traction motor 6. With respect to claim 22, the Wakuta and Adler combination does not teach or suggest a valve control device installed on the pump of the hydraulic work system with the valve control device integrated into the drive axle or fastened to the outside of the axle housing in the vicinity of the pump. With respect to claim 23, the Wakuta and Adler combination does not teach or suggest an oil tank connected to the hydraulic work system (i.e., hoisting cylinder, tilting cylinder, or hydraulic steering system) integrated into the elongated drive axle or located immediately next to the drive axle. The oil reservoir 2*b* of the Wakuta device is simply a self-contained oil reservoir within the wheel motor 37 that is

circulated by the pump 27 to cool the coil of the motor 6. Therefore, for all of the above reasons, claims 4 and 19-24 are believed patentable over the Wakuta and Adler combination.

b) Claims 2 and 3

Claims 2 and 3 stand rejected for obviousness over the teachings of Wakuta and Adler and Degonda.

Wakuta and Adler have been discussed above.

In paragraph 3 of the Office Action, the Examiner relies upon Degonda for teaching an axle 157 having two traction electric motors 155 located on the ends of the drive axle 157 (Fig. 25).

Claims 2 and 3 depend from claim 1 and are believed allowable because Degonda, either alone or in combination with Wakuta and/or Adler, does not teach or suggest the claimed invention. Specifically, Wakuta, Adler, and Degonda, either alone or in combination, do not fairly teach or suggest a fork lift truck having a traction drive system with a drive axle having at least one drive wheel on each end and that is substantially closed on all sides, with an electric motor and/or a pump of a hoisting cylinder, tilting cylinder, or hydraulic steering system located inside the axle housing. Both Wakuta and Adler teach independent wheel motors. The Degonda wheelchair appears to show in Fig. 25 a main axle 157 having an electric motor 155 located outside the main axle 157. Moreover, Appellant does not believe one of ordinary skill in the fork lift art would look to a wheelchair for modifying a fork lift traction drive.

Additionally, claim 3 includes the limitation that the electric motor and/or the pump of the hydraulic work system (i.e., hoisting cylinder, tilting cylinder, or hydraulic

steering system) is located axially between the traction motors inside the axle housing. In Wakuta, the small hydraulic pump that circulates oil from the reservoir 2*b* is located inside the casing 1 of the wheel motor 37. In the Degonda wheelchair, the electric motor 155 is outside of the main axle 157. In Adler, the traction motors 8 and 10 are not located in a housing but, rather, are independently attached to their respective wheels 4, 6. None of Wakuta, Adler, or Degonda, either alone or in combination, teaches or suggests the electric motor and/or pump of a fork lift truck hydraulic work system located axially between the traction motors inside a substantially closed axle housing, as claimed in claim 3. Therefore, for all of the above reasons, claims 2 and 3 are believed patentable over the cited prior art and in condition for allowance.

c) Claims 5-12

Claims 5-12 stand rejected for obviousness over the teachings of Wakuta, Adler, Degonda, and Braschler.

Wakuta, Adler, and Degonda have been discussed above.

Braschler discloses a wheel assembly for large off-road mining vehicles which the Examiner relies upon for the teaching of electric disk rotor motors or hydraulic motors. As best seen in Fig. 2B, Braschler discloses a drive axle 19 affixed to a non-rotatable housing 40 positioned within a rotatable wheel rim 42 having pneumatic tires 44 and 46 mounted thereon. An electric motor 50 is attached to the housing 40 with the output drive shaft 52 of the motor 50 connected to a gear-drive system 54 and 56. A hydrodynamic retarder 60 is located at the opposite end of the electric motor 50 from the output drive shaft 52 and is interconnected with the output drive shaft 52. The hydrodynamic retarder 60 can also include

a disc brake assembly 62. The hydrodynamic retarder 60 helps provide a constant braking torque throughout the speed range of the vehicle (Braschler at column 5, lines 1-3).

(i) Claims 5-7 and 9-12

Wakuta, Adler, Degonda, and Braschler do not teach or suggest a fork lift truck drive device having a traction drive system with a drive axle and an electric motor and/or a pump of the hoisting cylinder, tilting cylinder, or hydraulic steering system located inside the substantially closed axle housing. Wakuta teaches a cooling pump in an independent wheel motor. Adler does not have a pump. Degonda teaches a wheelchair with an electric motor located outside a main axle. Braschler teaches an electric motor 50 with a hydrodynamic retarder 60 connected thereto.

Additionally, the Wakuta, Adler, Degonda, or Braschler combination does not teach or suggest the limitation of claim 6 that the traction motors are hydraulic motors having secondary regulation systems. The Braschler motors are electric motors having a hydrodynamic retarder.

(ii) Claim 8

Claim 8 is directed to a drive device having a traction drive system with a drive axle and hydraulic work system comprising a hoisting cylinder and/or a tilting cylinder and/or a hydraulic steering system. The hydraulic work system includes at least one electric motor and/or at least one pump driven by the electric motor. The traction drive system has two hydraulic traction motors having secondary regulation systems. The traction motors are

connected to the pump of the hydraulic work system and the installed delivery capacity of the pump is in excess of the maximum amount required by the hydraulic work system.

None of Wakuta, Adler, Degonda, or Braschler teaches or suggests the claimed drive system in which the traction motors are hydraulic motors having secondary regulation systems. In each of Wakuta, Adler, Degonda, and Braschler, the traction motors are electric motors. Additionally, none of the references teaches or suggests the limitation that the traction motors are connected to the pump of the hydraulic work system (i.e., the pump of the hoisting cylinder or tilting cylinder or hydraulic steering system) with the delivery capacity of the pump in excess of the maximum amount required by the hydraulic work system. As discussed in the pending specification, this limitation ensures that the hydraulic traction motors can be operated even when the hydraulic work system is operated at its maximum capacity.

IX

CONCLUSION

For the reasons set forth above, Appellant believes claims 1-12 and 19-24 are patentable over the cited art and are in condition for allowance. Reversal of all of the Examiner's rejections and allowance of these claims are respectfully requested.

A check in the amount of $500.00 accompanies this Appeal Brief. The Commissioner of Patents and Trademarks is hereby authorized to charge any additional fees which may be required to Deposit Account Number 23-0650. Please refund any

overpayments to Deposit Account Number 23-0650. An original and two copies of this Appeal Brief are enclosed.

Respectfully submitted,

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APPENDIX A

1. (Previously Presented) A fork lift truck drive device, the drive device comprising:

a traction drive system having a drive axle with at least one drive wheel located on each end of the drive axle, wherein the drive axle has an axle housing that is substantially closed on all sides and is provided for connection with a vehicle frame; and

a hydraulic work system comprising at least one of a hoisting cylinder, a tilting cylinder, or a hydraulic steering system, the hydraulic work system comprising at least one electric motor and at least one pump driven by the electric motor,

wherein at least one of the electric motor and the pump of the hydraulic work system is located inside the axle housing.

2. (Original) The drive device as claimed in claim 1, wherein the drive axle has two traction motors.

3. (Previously Presented) The drive device as claimed in claim 2, wherein the traction motors are located on the ends of the drive axle and at least one of the electric motor and the pump of the hydraulic work system is located axially between the traction motors inside the axle housing.

4. (Original) The drive device as claimed in claim 2, wherein the traction motors are electric motors.

5. (Original) The drive device as claimed in claim 4, wherein the traction motors are electric disc rotor motors.

6. (Original) The drive device as claimed in claim 2, wherein the traction motors are hydraulic motors having secondary regulation systems.

7. (Original) The drive device as claimed in claim 6, wherein an installed delivery capacity of the pump is designed to deliver a volume of fluid required by the hydraulic work system.

8. (Previously Presented) A drive device for a machine, the drive device comprising:

a traction drive system having a drive axle; and

a hydraulic work system comprising at least one of a hoisting cylinder, a tilting cylinder, or a hydraulic steering system comprising at least one electric motor and at least one pump driven by the electric motor,

wherein at least one of the electric motor and the pump are integrated into the drive axle or are located directly on the drive axle,

wherein the drive axle has two traction motors,

wherein the traction motors are hydraulic motors having secondary regulation systems, and

wherein the traction motors are connected to the pump of the hydraulic work system, and the installed delivery capacity of the pump is in excess of a maximum amount required by the hydraulic work system.

9. (Original) The drive device as claimed in claim 2, including a reducing transmission installed downstream of each traction motor.

10. (Original) The drive device as claimed in claim 9, wherein the reducing transmissions are planetary gear trains.

11. (Original) The drive device as claimed in claim 1, wherein the drive axle has a single traction motor.

12. (Original) The drive device as claimed in claim 11, wherein the electric motor of the hydraulic work system is provided as the traction motor of the traction drive system.

13. (Canceled)

14. (Previously Presented) A drive device for a machine, the drive device comprising:

a traction drive system having a drive axle; and

a hydraulic work system having at least one electric motor and at least one pump driven by the electric motor,

wherein at least one of the electric motor and the pump are integrated into the drive axle or are located directly on the drive axle,

wherein the drive axle has an axle housing that is substantially closed on all sides and is provided for connection with a vehicle frame, and wherein at least one of the electric motor and the pump of the hydraulic work system are located inside the housing, and

wherein the axle housing has a housing middle segment and two housing end segments that are detachably fastened to the middle segment.

15. (Original) The drive device as claimed in claim 14, wherein at least one of the electric motor and the pump of the hydraulic work system are located in the housing middle segment.

16. (Original) The drive device as claimed in claim 14, wherein the drive axle has two traction motors and the traction motors are located in the housing middle segment.

17. (Original) The drive device as claimed in claim 14, including reducing transmissions located in the housing end segments.

18. (Original) The drive device as claimed in claim 14, wherein when the drive axle is installed, at least one housing end segment can be removed from the housing middle segment without removing the drive axle from the vehicle frame, whereby an interior of the housing middle segment is accessible after removal of the housing end segment.

19. (Original) The drive device as claimed in claim 1, wherein the drive axle includes at least one traction motor, wherein at least one of the electric motor of the hydraulic

work system and the traction motor of the traction drive system is an oil-cooled electric motor and is connected with an oil circuit of the hydraulic work system.

20. (Previously Presented) The drive device as claimed in claim 1, wherein a control of at least one electric motor or traction motor is fastened to the outside of the axle housing.

21. (Original) The drive device as claimed in claim 20, wherein the control is oil-cooled.

22. (Original) The drive device as claimed in claim 1, including a valve control device installed on the pump of the hydraulic work system, which valve control device is integrated into the drive axle or is fastened to the outside of an axle housing in the vicinity of the pump.

23. (Original) The drive device as claimed in claim 1, including an oil tank connected to the hydraulic work system and integrated into the drive axle or located immediately next to the drive axle.

24. (Previously Presented) The drive device as claimed in claim 1, wherein the fork lift truck is powered by an electric storage battery or by an electric fuel cell.